



A new apterous species of *Platypalpus* Macquart (Diptera: Hybotidae, Tachydromiinae) from Ecuador

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Abstract

Platypalpus is the most speciose genus of Tachydromiinae with approximately 550 described species, occurring preferentially in colder and temperate climates of the world. The genus is notably diverse in the Palaearctic, where almost 300 species are known, but it is much less diverse in tropical climates, a fact frequently attributed to the competition with species of *Elaphropeza* found in warmer regions. Despite the great variation of morphological features known, no apterous species of *Platypalpus* have been described. We describe *Platypalpus apterus* **sp. nov.**, a very curious new wingless species of *Platypalpus*, which is the first record of a wingless species in the genus. We provide detailed illustrations of the male and female genital segments. This species appears to belong in the *Platypalpus brevicornis* species-group, which until now has only been recorded from the Oriental and Palaearctic regions. Twenty-three species of *Platypalpus* are now known from the Neotropical Region.

Key words: Empidoidea, Hybotidae, Tachydromiini, *Platypalpus*, apterous, wingless, predaceous flies, Neotropical region

Introduction

Tachydromiinae is a very diverse subfamily of Hybotidae that comprises quite small predaceous flies. It is clearly monophyletic and its species are distinguished from other subfamilies by the apomorphic loss of vein M_2 and cell dm , neither pterostigma nor pseudotracheae, phallus with the apex not articulated and ejaculatory apodeme not fused to the base of phallus (Sinclair & Cumming 2006).

Platypalpus Macquart belongs to the tribe Tachydromiini and it is defined by the following characters: eyes bare, separated in both sexes, postpronotal lobe differentiated, scutum longer than broad (except in *P. brevicornis* species-group), mid leg raptorial, mid femur thickened and armed with rows of spine-like ventral setae, mid tibia usually with a somewhat prominent apical projection, wing with veins A_1 and CuA_2 present (cell cup present) (Grootaert & Shamshev 2012).

The genus is the most diverse of those in the Tachydromiinae, with approximately 550 species found almost worldwide, but preferentially inhabiting cold and temperate regions in the Nearctic and Palaearctic; it is particularly diverse in the latter region with 295 described species, whereas only 22 species are known from the Neotropics (Yang *et al.* 2007). In the tropics it is more diverse at higher altitudes and in cold regions, with few species known at lower altitudes and in tropical areas, where they likely compete with species of *Elaphropeza* Macquart that occupy similar habits and niches (Grootaert & Shamshev 2012). This apparent competitive exclusion is the probable reason the genus is not very diverse in tropical regions (op. cit.).

This paper describes a very curious new wingless species of *Platypalpus* from the Parque Nacional Cajas, Ecuador. It is the first wingless species described in the genus and is the 23rd species known from the Neotropical Region.

Material and methods

The material studied was loaned from the Kansas University Museum of Natural History (KUMNH), Lawrence, Kansas, USA, through the courtesy of its curator.

Terminology follows Cumming and Wood (2009) for the external morphology with modifications of Stuckenberg (1999) for the antennae, whereas the terminology for male and female terminalia follows the terms of Cumming *et al.* (1995), as modified by Sinclair (2000) and Sinclair and Cumming (2006). The term “seta” is generally used for macrotrichia, whereas “bristle” is used for relatively larger setae. The difference between “pruinescence” and “tomentum” is that presented in Cumming and Wood (2009). Setae on the scutum in descriptions reflect the setae on each side.

Terminalia were macerated in hot 85% lactic acid and stored in a microvial with glycerine attached to the specimen's pin. Information presented between square brackets is complementary data that is absent from labels. The holotype, one male and one female paratype are deposited in KUMNH, while one male and one female paratype are deposited in the Invertebrate Collection of the Instituto Nacional de Pesquisas da Amazônia (INPA), Manaus, Brazil. The specimens with the respective depository's collections are given in the “Type material examined” section at the end of the description.

Taxonomic account

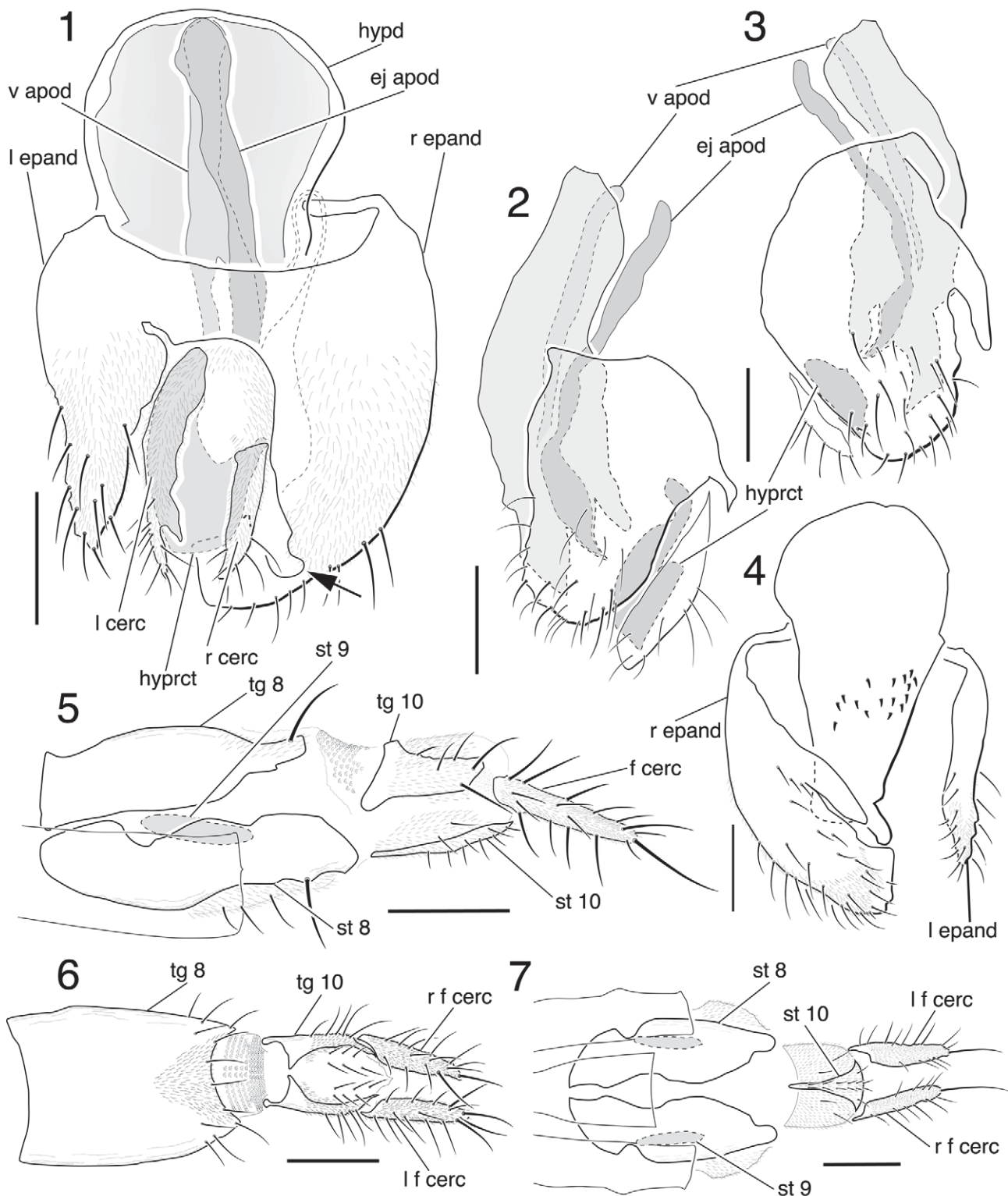
Platypalpus apterus sp. nov.

(Figs. 1–9)

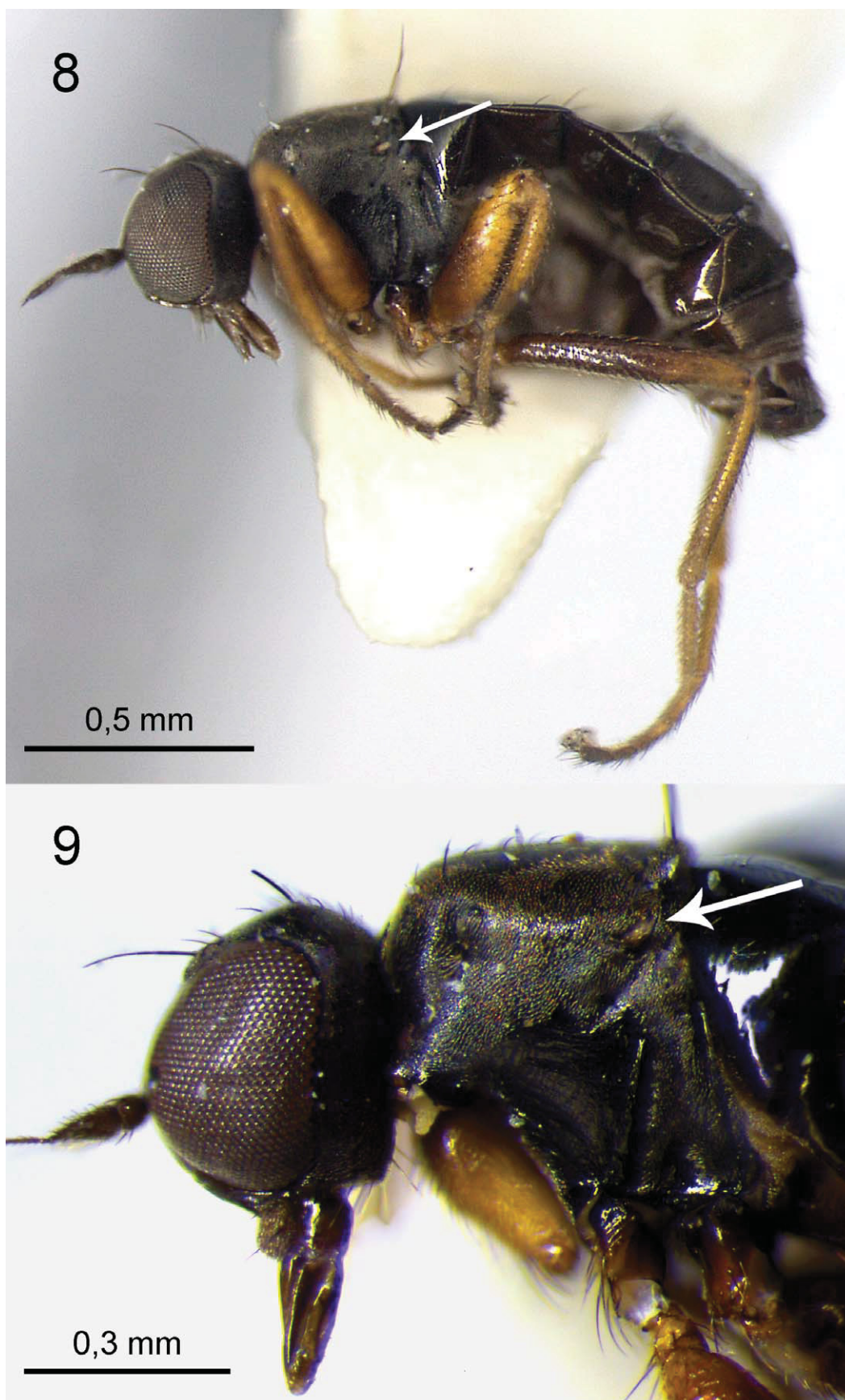
Diagnosis. Small, black wingless species. Head set very close to thorax. Two pairs of distinct vertical bristles, mesonotum as long as wide, scutellum very small. Fore and mid femora thickened, mid femur bearing 3 strong anterior apical bristles aligned, 2 ventral rows of numerous black, short and strong spines and a row of 7 long posteroventral bristles. Mid tibia with short acute apical projection (spur).

Etymology. From the Greek, “a” = negative prefix, “pterus” = wings, the specific epithets apterus refers to “the one who has no wings”.

Male. Body length: 1.8–2.2 mm. Head with vertex, ocellar triangle, frons, occiput and postgena sub-shining black, covered with gold tomentum, setae black. Median occipital sclerite with strong longitudinal depression prolonged up to neck. **Head** set very closely to thorax, without visible neck (except dorsally). Frons very wide with divergent sides. Face with silvery white tomentum, clypeus bare, eyes distinctly separated. Gena not developed below eyes. Two pairs of black vertical bristles, inner pair longest, divergent; outer pair about half length of inner pair, convergent. One pair of long ocellar bristles. Postocular and occipital setae in single row. Ocular notch triangular. Antenna brown, scape minute, pedicel bell-like, bearing circlet of minute bristles. Postpedicel conical, twice as long as wide, setulose, twice as long as scape and pedicel combined, bearing apical pubescent stylus twice as long as postpedicel. Palpus short, darkened, somewhat oval, bearing one long bristle. Proboscis strong, labrum black, labium with basal half black, apical half yellow. **Thorax** subshiny black, entirely covered with gold to white tomentum, except katepisternum bare with slight roughness. Scutum as long as wide, scattered hairy, black setae. Anepisternum elongated reaching fore coxa below, anepimeron inconspicuous, laterotergite greatly reduced, scutellum upward, very short, subscutellum like small fold (Fig. 9). Postpronotal lobe large, bearing 1 long inward and 2 very short bristles below. Acrostichals and dorsocentrals uniserial, with very tiny bristles. Other outstanding bristles: 2 short notopleurals, 1 long postalar, 1 long apical scutellar and 1 shorter lateral bristle about half length of apical pair. **Legs:** Fore coxa dark yellow bearing anterior white tomentum and 2 rows of setae, apical circlet with moderately long setae. Fore trochanter black to yellow. Fore femur yellow, except dorsal surface blackened; 1 row of long anteroventral setae, those of more ventral row longest; 1 row of posteroventral setae, shortening toward apex. Tibia yellow, somewhat brownish on anterior surface, bearing anterior comb of short setae. Fore tarsus yellow, darkened towards apex; pulvillus white. Mid leg raptorial, mid coxa black, anterior surface yellow with white tomentum and several long setae. Mid trochanter yellow, distally with circlet of short setae. Mid femur strongly thickened, 0.2 times wider than fore femur, brownish yellow, yellow at apical third, bearing 3 anterior aligned strong apical bristles and 1 long subapical bristle; 2 ventral rows of numerous black, short and strong



FIGURES 1–7. *Platypalpus apterus* Freitas-Silva & Ale-Rocha **sp. nov.** (Paratypes male and female). 1. Epandrium, hypandrium and cerci, dorsal view; black arrow indicates subapical invagination (see description); 2. Left epandrial lamella and hypandrium, lateral view (short setae omitted); 3. Right epandrial lamella and hypandrium, lateral view (short setae omitted); 4. Epandrial lamellae and hypandrium, ventral view; 5. Female ovipositor, lateral view; 6. Ovipositor, dorsal view; 7. Ovipositor, ventral view. Abbreviations: ej apod: ejaculatory apodeme; f cerc: female cercus; hypd: hypandrium; hyprct: hypoproct; l cerc: left cercus; l epand: left epandrial lamella; l f cerc: left female cercus; r cerc: right cercus; r epand: right epandrial lamella; r f cerc: right female cercus; st 8: sternite 8; st 9: sternite 9; st 10: sternite 10; tg 8: tergite 8; tg 10: tergite 10; v apod: ventral apodeme. Scale = 0.1 mm.



FIGURES 8–9. *Platypalpus apterus* Freitas-Silva & Ale-Rocha **sp. nov.** 8. Habitus, paratype male; 9. Head and thorax, holotype male. White arrows indicate the small stub of the reduced wing.

spines, 3 long ventral bristles near base; row of 7 black posteroventral long bristles. Mid tibia strongly arched ventrally, bearing 1 row of ventral black spines, with short and acute apical projection (spur), as long as tibia is wide. Mid tarsus yellow to black towards apex; pulvillus white. Hind coxa black, with long apical setae. Hind trochanter yellow, with circlet of apical setae. Hind femur black on basal two thirds, apical third yellow, slightly arched posteriorly, bearing 1 long apical bristle. Hind tibia yellow, with short apical comb of small yellow setae. Hind tarsus yellow, except apical tarsomere black, with white pulvillus. **Wing** not developed, represented by very small and lanceolate stub bearing 1 small bristle (Figs. 8, 9). Halter evidenced by very small stub, shorter than wing stub. **Abdomen** shining black, entirely sclerotized, bearing scattered short setae; segment 8 with tergite and sternite not fused, tergite very narrow. Terminalia brown, round; cerci (Fig. 1) strong, elongated, densely pubescent, right cercus shorter than left, left cercus narrowed apically; hypoproct longer on left side, apex rounded, shorter than cerci. Epandrial lamellae (Fig. 1) fused dorsally, left epandrial lamella fused with surstylus, shorter than right lamella, bearing several moderately long setae on apical margin (Fig. 2); right lamella wide, longest, apex rounded, with subapical invagination (see black arrow on Fig. 1), bearing lateral finger-like projection embracing hypandrium (Fig. 4), and with several moderately long setae on apical margin (Fig. 3), right surstylus fused to lamella. Ejaculatory and ventral apodemes present (Figs. 1–3). Hypandrium bearing several short strong setulae (Fig. 4), phallus strong, spine-like. **Female**. Body length: 1.7–1.8 mm. Similar to male including very small wing stub. Ovipositor with tergite and sclerite 8 not fused (Fig. 5). Tergite 8 narrow apically in lateral view. Sternite 8 divided longitudinally (Fig. 7), narrower at apex in ventral view. Sternite 9 oval, elongate (Figs. 5, 7). Tergite and sternite 10 separated (Fig. 5); tergite 10 longitudinally divided, with basal part wider (Fig. 5), almost touching other side, apical part narrow, pointed backward, with subtriangular form in dorsolateral view (Fig. 6); sternite 10 very narrow longitudinally (Fig. 7). Cercus narrow, elongate (Figs. 5–7).

Type material examined. **HOLOTYPE** ♂: ECUADOR: Azuay; 25 km NW Cuenca; [Parque Nacional Cajas, 02°46'48S, 79°13'26"W] Lago Toredora, 3800 m; 31 Dec[ember] 1991, C. Carlton; R. Leschen #78, ex: dead; branches, *Polylepis* bark [white rectangular label] / Holotype male; *Platypalpus apterus* **sp. nov.**; Freitas-Silva & Ale-Rocha, 2013 [Red rectangular label] (KUMNH). Condition of the Holotype: In good condition, not dissected, fore left leg lost after description. **PARATYPES**: 2 ♂, 2 ♀, same data as holotype [1 ♀, INPA]; Cajas, 3700 m, 7.i.1992 #127 ex: beating [1 ♂, 1 ♀, KUMNH; 1 ♂, INPA].

Geographical record. Ecuador (Parque Nacional Cajas).

Discussion

In empidoidea, reduction of the wings is well known and largely a phenomenon of the family Hybotidae (Grootaert & Shamshev 2008; Grootaert *et al.* 2009; Shamshev 1994; Sinclair 2010). In Tachydromiinae, an essentially wingless condition is far from common and is known to occur in three genera: an undescribed species of *Baeodromia* (Costa Rica; cit. Cumming 2006), *Pieltainia iberica* Arias, 1919 (Spain), *Tachydromia apterygon* Plant & Deeming, 2006 (Italy) and *T. rossica* Shamshev, 1994 (Mongolia and Russia) (Yang *et al.* 2007; Grootaert *et al.* 2009). Four additional genera (*Ariasella* Gil, *Chersodromia* Walker, *Dusmetina* Gil, and *Stilpon* Loew) include species with some degree of brachyptery, microptery or stenoptery. A list of additional brachypterous species of Empidoidea and their habitats is provided by Grootaert and Shamshev (2008).

The reduction of the wings seems to have caused several modifications in the general structure of the thoracic sclerites, particularly the upper posterior corner of the mesothorax that is intimately associated with the wing. In *P. apterus* **sp. nov.** the thorax is a very compact structure, with the sutures among the sclerites of the pleura very subtle and sometimes hardly distinguishable (see Figs. 8, 9). In this species, the anepisternum is elongated anteriorly reaching the fore coxa and the katepisternum seems to be normally developed. In contrast, the anepimeron is inconspicuous and is either fused to the anepisternum or completely lost, as is the laterotergite. The scutellum and subscutellum are also greatly reduced with the latter manifested as a small fold below the former. The posterior spiracle is very small and the halter is reduced to a very tiny stub. Although not necessarily linked to the lack of wings, the connection between the head and thorax observed in this species is very curious, and does not exhibit the neck-like connection usually found in other species of *Platypalpus*.

In other apterous and brachypterous species of Tachydromiinae there are similar modifications in the thoracic sclerites. In *Pieltainia iberica*, *Ariasella lusitanica* Grootaert, Shamshev and Andrade, 2009 and *A. pielaini* Gil, 1936, the scutellum is greatly reduced and the anepimeron is either fused to the anepisternum or lost, but the subscutellum is well developed, v-shaped and ingrown into the metatergite in dorsal view. Gil (1936) indicated that

the reduction of the wings, allied to the atrophy of the flight muscles, is responsible for the reduction of the volume of the thorax and the enlargement of the postpronotal callus. Grootaert *et al.* (2009) indicated that the morphology of the thorax is the main difference among the apterous or brachypterous genera closely related to *Tachydromia*. They also presumed that “the absence of functional wings probably provoked a reduction in the thorax volume and shape”. Bickel (2006) pointed also to the difficulty in determining the taxonomic position of secondarily flightless taxa due to the modification or loss of diagnostic features associated with flight, including the loss of mass of the thorax with the reduction of non-functional flight muscles. Therefore, the occurrence of similar modifications in a wingless species of *Platypalpus*, in our point of view, supports the observations of Bickel (2006), Gil (1936) and Grootaert *et al.* (2009).

The cases of wing reduction in Tachydromiinae are clearly independent events, which are likely an adaptation to specific environmental conditions in which they inhabit (Grootaert & Shamshev 2008), in this case the alpine habitat of Ecuadorian paramo. Two other flightless species of Empidoidea were described from the same habitat, at elevations between 4000–4200 m: *Papallacta stenoptera* Bickel, 2006 (Dolichopodidae) and *Ceratomerus apterus* Sinclair, 2010 (Brachystomatidae). One of the collectors of *Platypalpus apterus* **sp. nov.** also obtained, at the same locality, a new wingless species of Staphylinidae (Coleoptera), *Cajachara carltoni* Ashe & Leschen, 1995. Roff (1990) correlated the increase in altitude with flightlessness among insects, and Bickel (2006) attributed flightlessness of Dolichopodidae to cold and/ or overcast conditions, as found in wet montane tropics and alpine habitats, where the thermoregulation of thoracic flight muscles is difficult.

In the Oriental Region, Grootaert and Shamshev (2012) noticed that sampling above 500 m, various species of *Platypalpus* are found, while the number of *Elaphropeza* species drops. *Platypalpus apterus* **sp. nov.** was collected at 3700–3800 m, free from competition with species of *Drapetis* or *Elaphropeza*. This area was defined by Ashe and Leschen (1995) as being composed by mosaic habitats dominated by tundra grasses with patches of relatively dense *Polylepis* forests (varying from about 1 to 7 ha) at higher altitudes, the forests separated by grasslands, extending from above tree line (about 3200 m) to below the permanent snow line (about 5200 m). The parchment-thin bark of *Polylepis* (Simpson 1979), both on the trunk and dead on the ground, appears to be ideal microhabitats for species of *Platypalpus* foraging, looking for prey among small scavengers and decomposers, other small flightless insects or apterous arthropods.

The species of *Platypalpus* have been divided into 12 species groups (Chvála 1975; Grootaert 1984), although the classification is not rigorously supported phylogenetically. The division works well and has received more attention with Palaearctic (Chvála 1975; Grootaert & Chvála 1992) and Oriental (Grootaert & Shamshev 2006) species, and Grootaert and Shamshev (2006) show in preliminary analysis that most of the *Platypalpus* species-groups defined for the Palaearctic species are found in the Oriental region as well. Cumming (2000, 2002) assigned the Nearctic species to a number of these same species groups and Shamshev and Grootaert (2012) transferred the Nearctic species of *Charadrodromia* to *Platypalpus* considering that they belong to the *P. hackmani* group. However, the Neotropical fauna is scarcely known and no Neotropical species of the genus have been assigned to any species group. *Platypalpus apterus* **sp. nov.** appears to fit best in the *Platypalpus brevicornis* species-group because of the following combination of characters: two pairs of distinct vertical bristles, frons with wide divergent sides, thorax robust, mesonotum densely dusted (not polished) with distinct humeral bristles, katapisternum lacking tomentum, mid femur bearing long posteroventral bristles, and mid tibia with apical projection very small. Further studies on American, African and Australasian faunas of *Platypalpus* could reveal more details about the species groups inhabiting these regions.

This is the first time that a completely wingless condition is reported for a species of *Platypalpus* despite the high morphological diversity that has been observed in the genus. In addition, this is the second wingless tachydromiine species discovered from the Neotropical Region and the first apterous species of Tachydromiinae reported from South America.

Acknowledgements

We are in debt to the curators of the Kansas University Museum of Natural History, Dr. Michael Engels and Jennifer Thomas, who kindly arranged and sent the material used to describe the species, as well as Rui Andrade (Portugal), who sent exemplars of the species of *Ariasella* and *Pieltainia*. Our sincere thanks to Patrick Grootaert and Jeffrey Cumming for their kind and valuable comments to improve the early version of the manuscript. Igor Shamshev and one anonymous referee suggested important improvements during the peer-review process and we

sincerely thank them. We also thank the “Conselho Nacional de Desenvolvimento Científico e Tecnológico” (CNPq) for the support of the authors through a fellowship and grant provided for the project “Sistêmica morfológica de Hybotidae (Diptera: Empidoidea) com ênfase nas espécies neotropicais de Ocydromiinae e Hybotinae”, Edital Universal n. 14/11.

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